

ABSTRACT OF THE DISCLOSURE

Two phase modulators or polarizing elements are employed to modulate the polarization of an interrogating radiation beam before and after the beam has been modified by a sample to be measured. Radiation so modulated and modified by the sample is detected and up to 25 harmonics may be derived from the detected signal. The up to 25 harmonics may be used to derive ellipsometric and system parameters, such as parameters related to the angles of fixed polarizing elements, circular deattenuation, depolarization of the polarizing elements and retardances of phase modulators. A portion of the radiation may be diverted for detecting sample tilt or a change in sample height. A cylindrical objective may be used for focusing the beam onto the sample to illuminate a circular spot on the sample. The above-described self-calibrating ellipsometer may be combined with another optical measurement instrument such as a polarimeter, a spectroreflectometer or another ellipsometer to improve the accuracy of measurement and/or to provide calibration standards for the optical measurement instrument. The self-calibrating ellipsometer as well as the combined system may be used for measuring sample characteristics such as film thickness and depolarization of radiation caused by the sample.